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GEOGRAPHIC DIVISION
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STAFF STUDY

SELECTED MAPS OF ELECTRIC POWER FACILITIES IN WESTERN EUROPE, GREECE, AND TURKEY

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COPY FOR:

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I. INTRODUCTION

The purpose of this report is to recommend the best available map coverage of electric power facilities in West Germany, West Austria, Greece, Turkey, Switzerland, Belgium, France, Italy, Spain, Netherlands, and Denmark. The maps cited are the most up to date and authoritative country-wide maps showing transmission lines, electric power plants, substations, and, if available, consumption patterns.

In selecting the maps, a search was made of the holdings of the CIA Library, CIA Industrial Register, CIA Map Library, Engineer Strategic Intelligence Division and Map Libraries at the Army Map Service, Power Branch of ECA, Directorate of Intelligence of the Air Force, Intelligence Division of the Army, Federal Power Commission, Bureau of Reclamation in the Department of Interior, Export-Import Bank, and the Bureau of Railway Economics. Field offices of OO/C also cooperated in the survey.

The requirement that the maps selected be country-wide in coverage automatically imposed a scale limitation that excluded a large number of detailed plans showing individual installations and the lower voltage transmission lines in some highly developed areas. In general, however, the maps recommended show all the principal facilities of the electric-power network of each country.

Map representations of the electric power consumption pattern of the various countries is almost totally lacking. The only map of this type available, which covers Italy, gives a schematic presentation of the average annual per capita consumption of electric power in the various sections of the country and shows inter-regional import and export of power.

II. AREA-WIDE COVERAGE

The following small-scale maps are recommended primarily for purposes of orientation. From these maps, the user will be able to obtain an overall picture of the European electric power network, including international connections of transmission lines and electrified railways.

1. Réseaux de Transport d'Énergie Électrique d'Europe (Electric Power Transmission Networks of Europe); 1:2,000,000; L'Union Internationale des Producteurs et Distributeurs d'Énergie Électrique; 1947; in French and English; CIA Call No. 65167.[1] Unclassified

Thermal and hydroelectric generating plants, transformer and switching or disconnecting substations, and transmission lines are shown on this four-sheet, multicolored map covering nine of the eleven countries included in this survey. Greece and Turkey are not covered.

Five categories of transmission lines are distinguished -- those above 230 KV, double-circuit 220 KV lines that can be converted to single-circuit 400 KV lines, 200-220 KV lines, 100-150 KV lines, and main lines of 60-90 KV. Only the main generating plants connected to the transmission network are located.

2. Lignes Électrifiées des Principaux Réseaux de Chemins de Fer d'Europe et d'Afrique du Nord en Décembre 1950 (Electrified Lines of the Principal Railroad Routes of Europe and North Africa in December 1950); 1:8,500,000; from Revue Générale de Chemins de Fer, January 1951; CIA Call No. 72279. Unclassified

1. Unless otherwise indicated, CIA Call numbers given are for the Map Library.

On this map, electrified lines of the principal railways are shown for all the countries included in this survey except Turkey. A distinction is made among (1) the direct-current lines of 600-1,000 V, 1,200 V, 1,500 V, and 3,000 V, (2) the alternating-current lines that are monophase and 16-2/3 HZ - 15 KV, 15 HZ - 15 KV, 16-2/3 HZ - 12 KV, 16-2/3 HZ - 11 KV, 25 HZ - 6.5 KV, 50 HZ - 16 KV, and 50 HZ - 20 KV and (3) the alternating-current lines that are triphase and 16-2/3 HZ - 5.6 KV, and 25 HZ - 6 KV.

Although the amount of detail is limited by the small scale, the map provides a convenient general picture of the extent of railway electrification in Europe and North Africa.

III. WEST GERMANY

The electric power situation in West Germany is well covered by the following two maps.

1. Karte der ElektrizitÄtsversorgung in den vier Besatzungszonen Deutschlands (Map of the Electricity Supply in the Four Occupation Zones of Germany); 1:500,000; Arbeitsgemeinschaft der Landesverbände der ElektrizitÄtswerke AdEW; 1950; in German; CIA Call No. 72733. Unclassified

The areas supplied by public, private, and mixed private and public power plants are shown on this map. The supply areas are further broken down so as to show the area supplied by each company. If the power for an urban area and its environs is supplied by a municipal installation, the name of the town is underlined.

2. Karte der Hochspannungsleitungen in den vier Besatzungszonen von 30 KV and darüber (Map of the High-Tension Lines of 30 KV and Over in the Four Occupation Zones of Germany); 1:500,000; Arbeitsgemeinschaft der Landesverbände der ElektrizitÄtswerke AdEW; 1950, in German; CIA Call No. 72734, with accompanying map supplement. Unclassified

Transmission lines of 30-70 KV, 110 KV, and 220 KV are distinguished on this map. In the case of the smaller lines, the operating capacity is indicated along the line. Power plants are located and are distinguished as hydroelectric plants and bituminous, lignite, and other thermal plants. Transformer and switching stations are also located. Many of the individual facilities are identified by numbers keyed to pertinent detailed information in the accompanying map supplement.

IV. WEST AUSTRIA

The present electric power situation in Austria is well covered by available maps that are both recent and authoritative. An extremely valuable supplementary source for detailed information on Austrian power plants in textual form is "Bestandsstatistik über Unternehmen und Kraftwerke" (Current Statistics on Enterprises and Power Plants), 1951 edition, Bundesministerium für Verkehr und verstaatlichte Betriebe, Vienna (CIA Library Call No. 17M/6 736.9 .F1 1951).

1. Hochspannungsnetz u. Kraftwerke in Österreich (High Tension Net and Power Plants in Austria); 1:600,000; 1951; Bundesministerium für Energiewirtschaft u. Elektrifizierung; Available in Engineer Strategic Intelligence Division, AMS. Unclassified

This item, which is the best single map for Austria, shows hydroelectric and thermal power plants, transformer and switching stations, and transmission lines, with a distinction made between the facilities of the Austrian State Railways and those of the Austrian Government.

The total output, potential energy for an average year, and date on which construction was completed are given for each of the hydroelectric plants; maximum capacity is indicated for the thermal plants. Transmission lines are shown by capacity (220 KV, 110 KV, or under 60 KV) and by number of circuits.

A photostat copy (Confidential) of a 1949 edition of the same map is available under CIA Call No. 72818. On the photostat the title and legend are translated and a list of Austrian State Railways and government power stations that supply power for the railways is added.

2. U.S. Zone Austria, Land Upper Austria and Land Salzburg, Net of Electric Power Lines and Plants; 1:250,000; 1948; Hq. USFA, ODI, Photo-Topo, Salzburg; CIA Call No. 45877. Confidential

On this map, more detailed but less recent information for the U.S. Zone of Austria is shown.

V. GREECE

There is no power network in Greece, but map coverage of the limited electric power facilities of the country is available.

The Eastern European Branch, Engineer Strategic Intelligence Division (ESID), AMS, has a map in unpublished manuscript form that is being prepared for inclusion in NIS-24, Chapter VI, Section 62. 25X6 25X6 [redacted] Thermal and hydroelectric plants that are in operation and under construction, are located and classified as of 100-499 KW, 500-4,999 KW, and 5,000 KW or greater capacity. Existing substations and 15 KV and 22 KV transmission lines, as well as projected 150 KV lines are also shown.

For the Athens-Piraeus area, the only sector where a network can be said to exist at present, a more detailed manuscript sketch of the 22 KV lines is also available at ESID.

VI. TURKEY

There is no country-wide power network in Turkey. Power plants with capacities ranging from 2 KW upward have been built in many of the cities and villages; but the only transmission lines of significance are short lines from the Kayseri, Catalagzi, and Istanbul plants.

An indication of the difficulty to be encountered in a study of Turkish electric power may be gained by noting the discrepancies in installations and their capacities as show on Items 1 and 2, below, and in transmission lines as shown on Items 2 and 3. The most accurate picture can be obtained only by critical comparison of all reports and studies available.

Maps recommended for a study of power in Turkey are as follows:

1. Turkiyede Islemekte Olan Santrallari Gösterir Harta (Map showing Power Plants in Operation in Turkey); 1:3,200,000; /Turkish/ Elektrik Isleri Edüd; 1950; in Turkish; CIA Call No. 72936. Special Control

The power plants of Turkey located on this map are classified as coal, oil, water, and mixed installations. Each plant is further classified as either an industrial or a municipal-type installation. Capacity is indicated by city or town rather than by individual installation; consequently it is impossible to determine the capacity of individual installations in cities or towns having more than one.

A very similar map with the same title, available under CIA Call No. 48079, was found upon checking to be an earlier version of Item 1.

2. Present and Projected City and Industrial Power Plants; 1:1,000,000 /Turkish/ Elektrik Isleri Etüd; 1950; in English and Turkish; CIA Call No. 71457. Unclassified

Transmission lines and thermal, hydroelectric, and mixed power plants are located on this map, and the capacities of both power plants and transmission lines are indicated. Proposed electric-facility constructions are indicated.

8. Turkey Electric Power; 1:2,700,000; 1949 prepared by Engineer Strategic Intelligence Division for NIS-27, Chapter VI, Section 62; in CIA Library. Confidential

This map shows transmission lines and hydroelectric and thermal power plants of over 1,000 KW capacity. The established lower limit for showing power plants considerably reduces the value of the map as a result of the omission of the smaller plants.

VII. SWITZERLAND

Two maps are recommended to cover the power situation in Switzerland. Although they date back to 1947-48, the maps are the most recent available, and are believed to portray the present situation adequately.

1. Schweizerische Wasserkraft-Elektrizitätswerke und ihre Verbindungsleitungen (Swiss Hydroelectric Plants and Their Transmission Lines); 1:500,000; "Führer durch die schweizerische Wasser- und Elektrizitätswirtschaft," Verbandschrift No. 27, Vol. 1, 1949, published by the Schweizerischer Wasserwirtschaftsverband, map folded in back pocket; 1948; in German, French, and Italian; ID 620537. Unclassified

This map shows according to three categories all power stations with a potential production of over 300 KW and distinguishes between those with and without storage reservoirs. Transmission lines in operation between the central power stations and the substations, projected lines and lines of single-phase current are shown. Carrying capacity (three categories) and ownership are indicated for the lines, and transformer stations and substations are located.

2. Statistik der Wasserkraftwerke der Schweiz (Statistics of the Hydroelectric Plants of Switzerland); 1:500,000; Eidg. Amt für Wasserwirtschaft; 1947; in German and French; CIA Call No. 49133. Unclassified

The map shows according to seven categories the existing and projected hydroelectric plants with an installed capacity of over 450 horsepower. The individual plants are keyed by numbers to an accompanying text.

VIII. BELGIUM

Recent information is available in map form regarding the power transmission network of Belgium, but the available maps indicating capacity of power plants are out of date.

The following map is recommended for its presentation of the power transmission network:

1. 1950 Réseaux de Transport d'Énergie Électrique de Belgique (Belgian Routes of Electric Power Transmission); 1:1,000,000; Société pour la Coordination de la Production et du Transport de l'Énergie (C.P.T.E.); March 1950; in French; available at Western European Branch, Engineer Strategic Intelligence Division, AMS. Unclassified

On this map, transmission lines are indicated as existing, projected or under construction, or proposed, and are classified according to number of circuits. Power cables are distinguished from other lines. Four categories of carrying capacity are identified (15-40 KV, 50-70 KV, 100-150 KV, and 220 KV). In addition, the specific voltage of each line is indicated directly on the face of the map. Power plants are shown and classified as thermal or hydraulic, but plant capacities are not indicated. Transformer stations are located.

The following maps show power-station capacities in addition to the transmission lines, but they are not up to date. They are mentioned as the best of the available maps of power-plant capacities but are not recommended as adequate.

2. Belgium--Carte des Grands Réseaux de Transport d'Énergie (Belgium--Map of the Main Power Transmission Routes); 1:250,000; authority not identified [ca. 1945]; CIA Call No. 39864. Unclassified

3. Electric Utility Generating Plants and Transmission Lines in Belgium; 1:330,000; U.S. Federal Power Commission; April 1944; CIA Call No. 2253. Confidential

IX. FRANCE

A number of excellent maps of various aspects of the electric power situation in France are available, but no one map covers the subject as completely as might be desired. The following sources together supply information in map form on virtually all phases of the electric power industry of France except the present capacity of thermal power plants that existed before 1947. No map presenting this information is available, although Item 5, below, includes statistical data that supply the necessary information.

1. Carte du Réseau Électrique Français et de l'Électrification des Chemins de Fer (Map of the French Electric Network and of the Electrification of Railways); approximately 1:1,500,000; Presidence du Conseil, Secrétariat Général du Gouvernement, Direction de la Documentation; 1950; CIA Call No. 67422. Unclassified

Power plants are classified on this map as thermal, hydroelectric, or mixed, but plant capacities are not indicated. Transmission lines are shown and differentiated according to capacity (45 to 90 KV, 100 to 150 KV, 220 KV, or 380 KV) and number of circuits. Transformer and switching or shunting stations are located. For all power plants and lines, distinction is made between those in existence and those under construction or projected. In addition, the status of electrification of railroads in France is indicated.

2. Réseaux de Transport d'Énergie Électrique de France (Electric Power Transmission Networks of France); 1:1,250,000; Électricité de France (E.D.F.); 1949; CIA Call No. 61886, 1950 copy at 1:3,000,000 available in Western European Branch, ESID, AMS. Unclassified

Information presented is essentially the same as that on Item 1, above, except for electrification of railroads. Item 2, however, is more legible and has the advantage of showing voltage capacities of transmission lines directly on the map rather than only in the legend.

3. Centrales Hydrauliques et Thermiques en Construction et en Projet (Hydraulic and Thermal Power Plants under Construction and Projected); 1:1,000,000; Électricité de France (E.D.F.), Direction de l'Équipment; July 1950; CIA Call No. 71753. Unclassified

This map shows electric power plants put into service since January 1947, those under construction, and those being studied (for planning purposes). Plants are classified as thermal, hydraulic, or as associated with mines or iron and steel plants. Capacities of the power plants are indicated.

4. Centrales Hydrauliques (Hydraulic Power Plants); 1:500,000; Électricité de France (E.D.F.), Direction de l'Exploitation; May 1949; CIA Call No. 67434. Unclassified

All E.D.F. hydroelectric plants and all others with a capacity of 1,000 KW or more are located, and distinction is made between the two types of ownership. Installed capacity of plants is indicated according to six categories, ranging from 200 KW to more than 100,000 KW. No thermal plants are shown.

5. "Statistique au 1er Janvier 1949 des Centrales Hydrauliques et Thermiques d'au moins 1,000 kVA de puissance installée et des Réservoirs d'au moins 1 million de m^3 de tranche utile et emmagasinant au moins

1 million de kWH" (Statistics to 1 January 1949 on Hydraulic and Thermal Electric Power Plants of an Installed Capacity of at least 1,000 KVA and on Reservoirs of at least 1 million cubic meters usable capacity and storing at least 1 million KWH); Ministère de l'Industrie et du Commerce, Service Central de l'Électricité; July 1950; CIA Call No. F251-24 .F7 1950. Unclassified

This publication supplies useful information, in the form of maps and statistical tables, on the location and capacity of hydroelectric plants and reservoirs in France. It also gives details, in tabular form only, regarding the thermal power plants of the country. The volume is a valuable supplement to the previously cited sources.

X. ITALY

The power situation in Italy as of 15 May 1951 is adequately covered by two maps and a tabulation that appear in Relazione del Consiglio Direttivo All' Assemblea Dei SOCI, a publication by the Associazione Nazionale Impresse Distributrici di Energia Elettrica (ANIDEL). The tabulation covers the power plants under construction as of 15 May 1951. The name of the installation, ownership, province in which located, installed capacity, and percentage of completion are given. Effort is being made to procure a copy of the volume, which is not currently available. A copy of the tabulation may be borrowed, if necessary, from the Southeast Europe Section, Analysis Branch, Geographic Division, CIA (extension 2043).

1. Centrali Elettriche Italiane Aventi Una Potenza Installati di Almeno 5,000 KVA (Italian Electric Power Plants with an Installed Potential of At Least 5,000 KVA); approximately 1:3,000,000; 1951; ANIDEL; photostat copy, CIA Call No. 74030-R. Unclassified

On the map, hydroelectric, thermal, and steam (hot springs) power plants are located and are keyed by number to a marginal table that gives the name, date of completion, and capacity for each installation.

2. Carta delle Linee Elettriche Italiane ad Altissima Tensione (Map of the Italian High Tension Electric Lines); approximately 1:3,000,000; 1951; ANIDEL; photostat copy. CIA Call No. 74029-R. Unclassified

Transmission lines of 220 KV and 120-150 KV are shown and are classified as existing, under construction, or projected. In addition, hydroelectric and thermal power plants are identified as in use and under construction, and substations are located.

3. Rappresentazione Schematica degli Scambi e dei Consumi Regionali d' Energia (Schematic Representation of Exchange and of Regional Consumption of Energy); 1:8,250,000; "La Produzione di Energia Elettrica in Italia nel 1948," Servizio Idrografico, Ministero dei Lavori Pubblici, Rome, 1950 Fig. 8, p. 36; CIA Call No. 74028. Unclassified

This schematic map shows, by consumption region, the average annual per capita consumption of electric power in kilowatt hours. Also shown is the amount of power imported into and exported from each region.

XI. SPAIN

There is no recent map of the power situation in Spain that is completely accurate. The electric power map for inclusion in NIS-8, Chapter VI, Section 62 is now being compiled in ESID, AMS.

1. Mapa de las Instalaciones de Produccion, Transporte y Transformation de Energia Electrica (Map of the Installations for Production, Transmission, and Transformation of Electric Power); 1:750,000; 1946; Ministerio de Industria y Comercio; in Spanish; available at AMS as EIF 146167. Unclassified

Of those available, this is considered to be the most complete and authoritative map. On it, all of Spain and Mallorca are covered, and large-scale insets are given of Valencia, Malaga, Guipuzcoa, San Sebastian, Bilbao, Oviedo, Madrid, Coruna, and Barcelona.

The locations are indicated for (1) public and private hydroelectric, thermal, and mixed plants of over 500 KVA capacity, (2) high- and low-tension transformer stations, (3) substations connected to lines of over 30 KV, (4) dams and reservoirs, and (5) the capacities of the power plants and substations. Two categories of transmission lines of over 30 KV capacity are shown and the material from which the poles and conductors are constructed is indicated.

Lines of less than 30 KV are shown only if they connect with the lines of higher voltage, and the capacities of none of the smaller lines are given. If a line or portion of a line is underground, it is so indicated. A hand-colored photocopy of the map is available in the CIA Map Library under Call No. 61092.

2. Mapa de la Produccion Electrica de España (Map of Spanish Electric Production); 1:1,700,000; 1950 "Exclusivas TRIUNFO"; in Spanish; CIA Call No. 70259. Unclassified.

A more recent but generalized picture of the power situation is presented by this map. Hydroelectric and thermal plants of over 1,000 KVA are shown, with the capacity of each indicated. Main transmission lines are depicted, without indication of capacity. Dams and reservoirs of over 3,000,000 cubic meters are located. The several discrepancies occurring between this map and Item 1 can be only partially explained by the difference in dates.

3. Mapa de las Redes de Tensión Superior a 100 KV y de las Centrales de Potencia Superior a 30,000 KVA (Map of the Transmission Lines of More than 100 KV and of the Power Plants of More than 30,000 KVA Capacity); 1:3,500,000, in "Electric Power in Spain," published by the /Spanish/ Ministerio de Industria y Comercio, Dirección General de Industria, April 1951; available at AMS as EIF 152091. Unclassified

Principal plants and lines in use, under construction, and projected are shown on this page-size map.

XII. NETHERLANDS

The electric power facilities of Netherlands as of March 1950 are depicted on the map prepared for inclusion in NIS-4, Chapter VI, Section 62, which is recommended as the best country-wide map.

1. Netherlands -- Electric Power; 1:750,000; prepared by Engineer Strategic Intelligence Division, AMS, for NIS-4, Chapter VI, Section 62; March 1950; available in Western European Branch, ESID, AMS.
Confidential

This map shows power plants in operation and under construction and for each location, classifies the aggregate installed capacity of all plants according to the following categories: 500 to 25,000 KW, 25,000 to 100,000 KW, and 100,000 KW and over. No distinction is made as to type of basic power used, since all the plants are thermal.

On the transmission network shown, lines of 10, 50, 100, 150, and 220 KW are differentiated and are distinguished as existing or under construction. Selected substations are also located.

XIII. DENMARK

Recent information on the electric power facilities of Denmark is available in map form. For the best general picture of the country's power situation, the map prepared for inclusion in NIS-7, Chapter VI, Section 62, is recommended.

1. Denmark, Including Bornholm and the Faeroe Islands -- Electric Power; 1:875,000; prepared by Engineer Strategic Intelligence Division, AMS, for NIS-7, Chapter VI, Section 62; June 1951; available in Western European Branch, ESID, AMS. Confidential

This map shows power plants in operation and under construction and classifies them as hydroelectric, thermal, or hydro and thermal combined. For each location the aggregate installed capacities of all plants identified are indicated by symbols representing 1,000 to 5,000 KW, 5,000 to 25,000 KW, and 25,000 KW and over.

The transmission network given includes existing lines of 50 KV - 60 KV tension, selected 25 KV lines, and planned lines of 120 KV - 150 KV and 50 KV - 60 KV. Selected substations and line connections are also indicated.

The accompanying text supplies additional information on individual installations.